

Attorney's Docket No.: 06618/605001 / CIT 3188

In the Claims:

1. (Previously Presented) A device comprising a whispering-gallery-mode resonator formed of a spheroid made of an optical dielectric material and shaped with an eccentricity sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude.

2. (Original) The device as in claim 1, wherein said eccentricity is greater than 0.5.

3. (Original) The device as in claim 1, further comprising an optical coupling element disposed adjacent to said equator to evanescently couple optical energy into said resonator in at least one of said whispering-gallery modes, or out of said resonator from at least one of said whispering-gallery modes.

4. (Original) The device as in claim 3, wherein said optical coupling element includes a fiber tip with an angle-polished end facet to couple said optical energy.

Attorney's Docket No.: 06618/605001 / CIT 3188

5. (Original) The device as in claim 3, wherein said optical coupling element includes an optical planar waveguide with an angle-polished end facet to couple said optical energy.

6. (Original) The device as in claim 3, wherein said optical coupling element includes a prism.

7. (Original) The device as in claim 1, wherein said dielectric material is doped with active ions to produce optical gain at a laser emission wavelength by absorbing pump light at a pump wavelength shorter than said laser emission wavelength.

8. (Original) The device as in claim 1, wherein said dielectric material is an electro-optic material, and further comprising electrodes positioned to apply an electrical control voltage to said spheroid to modulate optical energy in said resonator.

9. (Original) The device as in claim 1, wherein said spheroid has a dimension less than 10 mm.

Attorney's Docket No.: 06618/605001 / CIT 3188

10. (Previously Presented) A method, comprising:
providing a whispering-gallery-mode resonator formed of a spheroid made of an optical dielectric material; and
shaping the spheroid to produce a sufficiently large eccentricity so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude.

11. (Original) The method as in claim 10, further comprising coupling optical energy into said resonator in at least one of said whispering-gallery modes.

12. (Original) The method as in claim 10, further comprising:

coupling an output laser beam from a CW laser into said resonator in at least one of said whispering-gallery modes;

coupling optical energy out of said resonator from at least one of said whispering-gallery modes to produce a feedback signal; and

feeding said feedback signal back to said laser to control a laser frequency.

Attorney's Docket No.: 06618/605001 / CIT 3188

13. (Original) The method as in claim 10, further comprising using said resonator to filter an optical beam to produce a filtered optical beam in a frequency of one of said whispering-gallery modes.

14. (Original) The method as in claim 10, further comprising:

using an optical modulator to modulate a cw laser beam in response to an electrical control signal;

coupling a portion of said modulated laser beam into said resonator in at least one of said whispering-gallery modes;

converting an optical output from said resonator into an electrical signal; and

using at least a portion of said electrical signal as said electrical control signal to control said optical modulator.

15. (Previously Presented) A device, comprising:

a cw laser operable to produce a laser beam at a laser frequency;

a whispering-gallery-mode resonator formed of a spheroid made of an optical dielectric material and shaped with an eccentricity sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along

Attorney's Docket No.: 06618/605001 / CIT 3188

an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude; and

a coupling element disposed adjacent to said resonator to evanescently couple said laser beam in optical energy into said resonator in at least one of said whispering-gallery modes and a feedback optical signal out of said resonator from at least one of said whispering-gallery modes into said laser to control said laser frequency.

16. (Original) The device as in claim 15, wherein said laser includes a diode laser.

17. (Previously Presented) A device, comprising:

an optical modulator operable to respond to an electrical control signal to modulate an input optical beam to produce a modulated signal;

a whispering-gallery-mode resonator formed of a spheroid made of an optical dielectric material and shaped with an eccentricity sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and

Attorney's Docket No.: 06618/605001 / CIT 3188

around a short ellipsoid axis of said spheroid are compatible in magnitude; and

a coupling element disposed adjacent to said resonator to evanescently couple a portion of said modulated signal into said resonator in at least one of said whispering-gallery modes; and

a photodetector coupled to receive an optical output from said resonator to produce said electrical control signal.

18. (Previously Presented) The device as in claim 17, wherein said optical modulator includes:

a whispering-gallery-mode resonator formed of a spheroid made of an electro-optic material to receive said input optical beam; and

electrodes positioned to apply said electrical control signal to said spheroid to modulate optical energy in said resonator to produce said modulated signal.

19. (Previously Presented) A device comprising an optical resonator formed of an optical dielectric material and including a region to support different set of whispering-gallery modes, wherein said region of said optical resonator has a circular cross section around which the whispering-gallery modes circulate and a shape that is not part of a sphere to be

Attorney's Docket No.: 06618/605001 / CIT 3188

spatially more restrictive than a spherical surface to the whispering-gallery modes in a direction perpendicular to the circular cross section.

20. (Previously Presented) The device as in claim 19, further comprising an optical coupling element disposed adjacent to said optical resonator to evanescently couple optical energy into said nonspherical cavity in at least one of said whispering-gallery modes, or out of said optical resonator from at least one of said whispering-gallery modes.

21. (Previously Presented) The device as in claim 20, wherein said optical coupling element includes a fiber tip with an angle-polished end facet to couple said optical energy.

22. (Previously Presented) The device as in claim 20, wherein said optical coupling element includes an optical planar waveguide with an angle-polished end facet to couple said optical energy.

23. (Previously Presented) The device as in claim 20, wherein said optical coupling element includes a prism.

Attorney's Docket No.: 06618/605001 / CIT 3188

24. (Previously Presented) The device as in claim 19, wherein said optical dielectric material is doped with active ions to produce optical gain at a laser emission wavelength by absorbing pump light at a pump wavelength shorter than said laser emission wavelength.

25. (Previously Presented) The device as in claim 19, wherein said optical dielectric material is an electro-optic material, and the device further comprising electrodes positioned to apply an electrical control voltage to said optical resonator to modulate optical energy therein.

26. (Previously Presented) The devices as in claim 1, wherein said optical dielectric material includes a silica glass.

27. (Previously Presented) A device, comprising:
an electro-optic modulator to respond to an electrical control signal to modulate an input optical beam to produce a modulated signal, said modulator comprising:

a whispering-gallery-mode resonator formed of a spheroid made of an electro-optic material to receive said input optical beam, wherein said modulator is shaped with an eccentricity

Attorney's Docket No.: 06618/605001 / CIT 3188

sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude, and

electrodes positioned to apply said electrical control voltage to said spheroid to modulate optical energy in said resonator to produce said modulated signal;

a coupling element disposed adjacent to said resonator to evanescently couple a portion of said modulated signal into said resonator in at least one of said whispering-gallery modes;

an optical delay element to receive at least a portion of said modulated signal from said resonator to cause a delay in said portion of said modulated signal;

a photodetector coupled to receive said portion of said modulated signal from said optical delay element to produce said electrical control signal.

28. (Previously Presented) A device, comprising:

a semiconductor optical amplifier to produce an optical gain for input light at a laser wavelength to produce amplified output light;

a first waveguide coupler to direct said input light into said semiconductor optical amplifier;

Attorney's Docket No.: 06618/605001 / CJT 3188

a second waveguide coupler to receive said amplified output light from said semiconductor optical amplifier; and

a whispering-gallery-mode resonator optically coupled between said first and said second waveguide couplers to receive said amplified output light and to output light as said input light to said first waveguide coupler, said resonator formed of a spheroid and shaped with an eccentricity sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude.

29. (Previously Presented) A device, comprising:

a whispering-gallery-mode resonator in a shape of a spheroid having an equator in a circular cross section of said spheroid that is perpendicular to a short ellipsoid axis of said spheroid; and

an optical coupler to couple light into said resonator in a whispering gallery mode that circulates around said equator.

Please add the following new dependent claims:

Attorney's Docket No.: 06618/605001 / CIT 3188

30. (New) The device as in claim 27, wherein said optical coupling element comprises a fiber tip with an angle-polished end facet.

31. (New) The device as in claim 27, wherein said optical coupling element comprises an optical planar waveguide with an angle-polished end facet.

32. (New) The device as in claim 27, wherein said optical coupling element comprises a prism.

33. (New) The device as in claim 27, wherein said optical delay element comprises a fiber loop.

34. (New) The device as in claim 27, wherein said optical delay element comprises an optical resonator.

35. (New) The device as in claim 29, wherein said resonator comprises active ions to produce optical gain at a laser emission wavelength by absorbing pump light at a pump wavelength shorter than said laser emission wavelength.

Attorney's Docket No.: 06618/605001 / CIT 3188

36. (New) The device as in claim 29, wherein said resonator comprises an electro-optic material, and the device further comprising electrodes positioned to apply an electrical control voltage to said resonator to modulate optical energy in said resonator.

37. (New) The device as in claim 29, wherein said optical coupler comprises an optical planar waveguide with an angle-polished end facet.

38. (New) The device as in claim 29, wherein said optical coupler comprises a prism.

39. (New) The device as in claim 29, wherein said optical coupler comprises a fiber tip with an angle-polished end facet.